

5.7 Beaver Creek - Firehall Water Supply System

The Beaver Creek Firehall has water supplied from a 34.0 m deep well (Well 3102-A). The system is governed under the Sections 12.1 (a) and (b) and 17 of the Public Health and Safety Act and Section 5 of the Public Health Regulations (C.O. 1958/079, O.I.C. 2009/194), which require safety measures and inspection for water and water sources for systems that provide for human consumption. A new well was drilled and tested at the site in 2007, however we understand that the well was not ever commissioned due to permafrost/freezing issues.

5.7.1 Data Compilation Methodology

Tetra Tech approached stakeholders including water system operators and owners to let them know the project was in progress and to request their assistance in compiling the most complete data set possible. Through the process of compiling the data, Tetra Tech has had communication with YG PMD regarding all water systems they operate and/or maintain. YG PMD has provided review comments review comments and data for the compilation.

5.7.2 Hydrogeology

There was no driller's log for Well 3102-A available for review. Most of the wells in the Beaver Creek area indicate coarse sand and gravel with cobbles and small boulders to depths of at least 30 m. The well logs also indicate that discontinuous lenses of finer-grained sediments persist throughout the area; however, the sediments are generally dominated by coarse alluvium. Some discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. Due to the variability of sediments in the Beaver Creek area, some areas may have significantly higher vulnerability to surface source of contamination than others. A study previously completed in the Beaver Creek area by Tetra Tech determined that the direction of groundwater flow in the vicinity of the site is north to northeasterly (Tetra Tech 2006).

Pumping test results from Well 3102-B indicate an aquifer transmissivity in the order of $3 \times 10^{-3} \text{ m}^2/\text{s}$ (259.5 m^2/day) (Tetra Tech 2008).

5.7.3 Well Summary

The log for the Beaver Creek Firehall Well (Well 3102-A) serving the system is not available for review. The following table summarizes the completion characteristics of the well.

Table 5-17: Beaver Creek Firehall, Well 3102-A Summary		
Well Construction Parameters	Details	Source
Date of construction	Unknown	Tetra Tech 2006
Total well depth	34.0 m bgs	
Casing	6" (152 mm) ID Steel Well Casing	
Casing depth	Unknown	
Well screen	Unknown	
Static water level	13.1 m bgs (July 2005)	
Sanitary seal	No record that a bentonite sanitary seal has been installed	

Table 5-17: Beaver Creek Firehall, Well 3102-A Summary

Well Construction Parameters	Details	Source
Wellhead completion	The well is completed with a pitless adapter in the yard of the new Firehall. The well was not equipped with bollards to protect it from vehicle traffic at the time of inspection.	Tetra Tech 2015 site visit
Wellhead stickup	Approximately 0.4 m ags	Tetra Tech 2015 site visit
Well rated capacity	Unknown	Tetra Tech 2006
Well GUDI status	Potentially GUDI	Based on well construction
Well Construction Comments:	Well was not constructed to meet Canadian Groundwater Association Well Construction Guidelines.	

Table 5-18: Beaver Creek Firehall (Unused), Well 3102-B Summary

Well Construction Parameters	Details	Source	
Date of construction	Well was completed by Double D Drilling in September 2007.	Tetra Tech 2008	
Total well depth	41 m bgs		
Casing	6" (152 mm) ID Steel Well Casing		
Casing depth	38.9 m bgs		
Well screen	1.2 m of 80-slot (2.03 mm) stainless steel well screen from 39.8 m bgs to 41 m bgs		
Static water level	12.3 m bgs (September 26, 2007)		
Sanitary seal	Bentonite surface seal to 6 m depth		
Wellhead completion	Unknown – well was equipped with a lockable circle plate at the time of completion		
Wellhead stickup	1.0 m ags at the time of well completion		
Well rated capacity	4.5 L/s (60 IGPM)		
Well GUDI status	Non-GUDI		
Well Construction Comments:	Well was constructed to meet Canadian Groundwater Association Well Construction Guidelines. Tetra Tech understands this well was never commissioned due to permafrost and freezing issues.		

5.7.4 Source Water Quality

Tetra Tech reviewed water quality results from the original water well 3102-A from 2004 and 2005 as well as those collected from the new water well upon completion in 2007. In general, the water from the Firehall well 3102 A met the GCDWQ in the 2004 and 2005 results for the parameters analyzed and the key observations and comments noted in the 2006 SPDWSA assessment and the 2007 Well 3102-B well completion report are (Tetra Tech 2006 and 2007):

- Water from both Well 3102-A and Well 3102-B was a very hard calcium-bicarbonate type with hardness ranging from about 170 mg/L to 214 mg/L and pH of 7.79 to 8.4;
- Although the copper concentration measured in the 2004 and 2005 results was not in exceedance of the GCDWQ maximum allowance concentration (MAC), copper was elevated with respect to regional groundwater quality for the Beaver Creek area;
- The new well 3102-B had copper concentrations below detection limit at the time of completion in September 2007;
- The new well 3102-B had lead concentration more than an order of magnitude lower than those observed in well 3102-A;
- Although the lead concentration was not in exceedance of the GCDWQ MAC in either well, lead was elevated with respect to regional groundwater quality for the Beaver Creek area;
- The screening for Extractable Petroleum Hydrocarbons (EPH) in 2005 did not indicate any parameter above detection limits;
- Turbidity of the water sample ranged from 2.3 NTU to 2.69 NTU when sampled between September 2004 and July 2005. Health Canada recommends that groundwater sources provide water with turbidity less than 1.0 NTU and that water from GUDI sources have appropriate filtration and disinfection. Filtration was expected to achieve a turbidity level of 1.0 NTU for slow sand or diatomaceous earth filtration, 0.3 NTU for conventional direct filtration and 0.1 NTU for membrane filtration in 95% of samples between filter changes or per month with no measurements exceeding 3.0 NTU;
- Turbidity measurements from well 3102-B were significantly lower upon completion in 2007 than those observed in well 3102-A.

5.7.5 Water Treatment and Distribution

Table 5-19: Beaver Creek Firehall Water Treatment and Distribution Details		
Item	Details	Source
Owner/Operator	Government of Yukon	Tetra Tech 2006
Water source	Groundwater	
Well serving the system	Well 3102	
Treatment type	Sediment filtration, reverse osmosis, chlorination	M. Eckervogt 2017
Water users	Public fill station and Firehall	Tetra Tech 2006

Table 5-19: Beaver Creek Firehall Water Treatment and Distribution Details		
Item	Details	Source
Delivery method	Directly connected to the Firehall and a water fill station outside the Firehall for public use	Tetra Tech 2006
Age of system/last known update	A new Firehall was completed in 2015.	

5.7.6 Source Water Protection Planning

At the time of the 2006 assessment, the well was located within 30 m of potential contaminant sources, including an above-ground storage tank at 3.5 m, a leach pit located at approximately 16 m, and garage activities immediately adjacent to the wellhead (Tetra Tech 2006).

There is no source water protection planning in place for the Beaver Creek Firehall Well 3102-A in Beaver Creek. The interbedded nature of the fine sediments which persist in the area, and the thick unsaturated zone provides some limited aquifer protection from surficial sources of contamination (moderate vulnerability as indicated previously). The vulnerability of the overburden aquifer underlying the community of Beaver Creek is variable due to variation in the sedimentary sequence. Implementing a source water protection plan for the community of Beaver Creek would provide a comprehensive approach to protecting this groundwater resource.

5.7.7 Water Supply Information Data Gaps

YG PMD has reviewed this summary and provided comments. To our knowledge, this system summary includes all available data and is accurate and up to date as of March 2017. Tetra Tech identified the following data gaps:

- No SWPP is in place for this groundwater resource; Source water protection planning here could be incorporated into a greater Beaver Creek SWPP and provide comprehensive planning to protect the moderately vulnerable groundwater resource.